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Demonstration of Selected Improved Tef (*Eragrostis tef* (Zucc.) Varieties with their Agronomic Management Practices at Ura District in Assosa Zone

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Abstract: Tef is a foremost staple cereal crop with substantial contribution in the GDP of Ethiopia. Tef grain is highly nutritious gluten-free as well as high quality forage. However, lack of improved tef varieties reduced the production and productivity of tef in Assosa areas. Hence, the objective of this study is to demonstrate and create awareness about the recently released improved tef varieties for target area. The three recently released improved tef varieties (Dursi, Ebba, Areka-1) and standard check Quncho variety was evaluated on plot size 10m by 10m at adjacent plots. The highest grain yield (1413.68 kg per ha) was obtained by Dursi variety while the lowest grain yield (894.24 kg per ha) was recorded by Quncho variety. The demonstrated tef varieties were Dursi, Areka-1 and Ebba had yield advantage over standard check (Quncho) variety by 36.74%, 14.33% and 9.63%, respectively. Based on selection criteria such as grain yield, plant height, panicle length, diseases resistance and seed color farmers were selected Dursi variety. Based on grain yield obtained and farmers' selection criteria we recommended that Dursi tef variety will give better yield for target area.

Keywords: District, tef varieties, improved tef, demonstration.

Research Paper

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INTRODUCTION

Teff [Eragrostis tef (Zucc.) Trotter] is an allotetraploid (2n=4x=40) crop belonging to the grass family poaceae and it is among the major cereals of Ethiopia. It has the largest value in terms of both production and consumption in Ethiopia and the value of the commercial surplus of teff is second only to coffee (Minten *et al*., 2013). It is endemic to Ethiopia and it has been widely cultivated in the country for centuries (Hailu and Yifru 2005). It is the major staple cereal crops and highly adapted to diverse agroecological zones including conditions marginal to the production of most of the other crops (Hailu and Seyfu. 2001). Teff is resistant to extreme water conditions, as it is able to grow under both drought and water logged conditions (Hailu and Yifru, 2005, Minten *et al*., 2013).

Tef is produced for different purposes including food and feed, cash and foreign currency earnings. Tef has been a supper-staple food for over 50 million people of Ethiopia and preferred endemic grain crop that is the known favorite national food relaxed in most Ethiopian main dishes. Tef straw (chid), besides being the most appreciated feed for cattle, it is also used to reinforce mud and plaster the walls of house and local grain storage facility called gotera (Adera, 2016).

Since teff is the staple food of most Ethiopian people, the current production system cannot satisfy the consumers' demand. This is because of lack of improved variety, agronomic constraints that include lodging, low modern input utilization, and high post-harvest losses and sowing method (Amare and Adane, 2015). In Benishangul Gumuz region it covers about 0.025 million hectares of land and 0.329 million tons of grain was produced during 2017/18 cropping season. Even if; the region is considered as non-traditional tef growing region; Matakel, Assosa and Mao Komo areas are major tef producing zones (Tesfaye *et al*., 2021). The regional average grain yield of teff is about 1.62 t ha-1 (CSA, 2018) whereas tef production in Assosa zone is low as compared Metekel zone and Mao Komo special district. To overcome the problem demonstrating recently released tef varieties along with standard check i.e Quncho variety has great role to improve the productivity and production of target areas. The main objective of this study is to demonstrate and create awareness about the recently released improved teff varieties to farmers, DAs and experts.

MATERIALS AND METHODS

Description of the Study Area

The trial was conducted in Benishangul Gumuz Regional State, at Ura district Selga 23 kebele in the 2023

main cropping season under rain fed conditions. Benishangul Gumuz Regional State is geographically located at the latitude of 9°30' to 11°39" N and longitude of 34° 20' to 36° 30"E Assosa located at altitude about 1553 m above sea level and about 662km from the Capital city of Ethiopia. Asossa has unimodal rainfall pattern, which starts at the end of April and extends to mid-November, with maximum rainfall received in June, July, August, September, and October. The total annual average rainfall of Asossa is 1275 mm. The minimum and maximum temperatures are 16.75°C and 27.92°C, respectively (EARO, 2004).

Plant Materials, Experimental Procedures and Trial Management

Three recently released tef varieties were Ebba, Areka-1 and Dursi were evaluated with one check variety called Quncho was used. The activity was sown in row planting. The plot size was 10m x 10m ($100m^2$) and distance between plots is 1m. Fertilizer rates 121 $kgha^{-1}$ NPS was applied at the time of planting whereas 120 $kgha^{-1}$ Urea was applied in the form of split application, half of which was applied together with NPS at sowing time and the remaining was top dressed at tillering stage. All agronomic practices were applied as per recommendation.

Table 1: Four tef varieties were used for demonstration

S. N	Variety	Year of released	Center	Altitude (m.a.s.l)
1	Ebba	2019	Debre Zeit ARC	
2	Dursi	2018	Bako ARC	1850-2500
3	Areka-1	2017	Areka-1 ARC/SRARI	
4	Quncho	2006	Debre Zeit ARC	1500-2500

Data Collection

Plant Based Data Collection

Plant height (cm): The height of the plant from the bottom to the tip of the panicle at maturity on 5 randomly tagged plants.

Panicle length (cm): The length of individual panicle measured from panicle base to tip of the panicle using randomly selected representative plant.

Grain yield (GY): Grain yield obtained from total harvest of the plot and then converted to kg/ha.

Straw yield (kg): Was measured after threshing and measuring the grain yield; the straw yield was obtained by subtracting the grain yield from the total above-ground biomass yield.

Varietal Selection Procedures

Farmers set and prioritized criteria for the varietal selection. The criteria for selection included plant height, panicle length, lodging index, shoot biomass, seed color and grain yield. The varieties were evaluated using farmers' selection criteria. All of them were tabulated in a matrix scoring table and each selection criterion was compared with another in a pair wise fashion. The rank assignments were determined from the number of times each selection criterion was preferred by the group. A direct matrix table was prepared for the tef varieties. Scores were given to each variety based on the selection criteria (1= Excellent, 2= Very good, 3=Good and 4= poor).

Data Analysis Method

Simple descriptive statistics and qualitative analysis of farmers' feedback were used to analysis the data.

RESULTS AND DISCUSSIONS

Growth and Yield Performance

The maximum plant height (117.4 cm) and panicle length (52.8cm) traits were obtained in Dursi variety while the lowest plant height (45.8cm) and panicle length (28.4cm) traits were recorded by Areka-1 variety (Table 2). The panicle length is directly related to the grain yield. This result in line with the findings of (Tsion *et al*., 2020, Yazachew *et al*., 2020) who stated that panicle length and plant height were genetically influenced by breeding material or variety for development of tef cultivars.

The highest grain yield (1413.68 kg per ha) was obtained by Dursi tef variety while the lowest grain yield (894.24 kg per ha) was recorded by Quncho variety (Table 2). The demonstrated tef varieties were Dursi, Areka-1 and Ebba had yield advantage over standard check (Quncho) variety 36.74%, 14.33% and 9.63%, respectively. This result is similar with the findings of (Endale and Hana, 2023) who reported that demonstrated Ebba and Niguse tef varieties had yield advantage over standard check (Dagime variety).

The highest biomass (3650 kg per ha) was recorded by Dursi variety while the lowest biomass (2900 kg per ha was obtained by Quncho variety (Table 2). The variety those have high in grain yield also high in biomass yield (Table 2). Apart from the grain yield, it is also very important for the farmers reinforce mud and plaster the walls of house and local grain storage facility called gotera to build and get tef straws for their animals feeding since there is scarcity of feeding during the dry season in the areas.

Table 2: Mean of growth performance and yield trait of improved tef varieties at Ura district

Varieties	Plant height	Panicle length	Biomass kg per ha	Grain Yield kg per ha
Dursi	117.4	52.8	3650	1413.68
Ebba	85.4	38.6	3225	1030.4
Areka-1	45.8	28.4	3300	1096.8
Quncho	64.8	33.6	2900	894.24
Mean	78.35	38.35	3268.75	1108.78

Farmers' Selection Criteria

Farmers have their own selection criteria to use certain technology. As a result, the most important selection criteria for each tef variety were grain yield, plant height, panicle length, disease resistance, seed color and lodging index. Based on selection criteria farmers put the disease resistance trait as first criteria to select variety. The seed color and grain yield traits were ranked as the 2nd and the 3rd selection criteria of for farmers, respectively. Most of time in Assosa area tef was affected by shoot fly that why the farmers ranked 1st diseases or insect resistance trait.

Table 3: Pair wise ranking of tef traits based on farmer's selection criteria

No.	Trait of Interest	Grain yield	Panicle length	Plant height	Lodging index	Diseases/insect resistance	Seed color	Score	Rank
1	**Grain yield**		Grain yield	Grain yield	Grain yield	Diseases	Seed color	Grain yield(3)	3rd
2	**Panicle length**			Panicle length	Panicle length	Diseases	Seed color	Panicle length(2)	4th
3	**Plant height**				Plant height	Diseases	Seed color	Plant height(1)	5th
4	**Lodging index**					Diseases	Seed color	Lodging (0)	6th
5	**Diseases**						Diseases	Diseases (5)	1st
6	**Seed color**							Seed color(4)	2nd

Tef varieties ranking

Based on selection criteria the top-ranked variety was assessed depend on the overall mean score. So, Dursi variety was selected based on all of its features, including yield, plant height, diseases resistance and other traits. Farmers were selected Quncho variety next to Dursi variety based on selection criteria during field day event. After field day event was conducted all varieties were harvested and threshed, unfortunately Quncho variety was recorded lower yield as compared to other varieties.

In 2023/2024 E.C cropping season Assosa area got heavy rain fall during October and November months than for 3 last years. Due to heavy rain fall occurrence the yield of tef become low as compared to last year. However, Dursi variety was gave highest yield compared to other varieties.

Table 4: Direct matrix ranking evaluation of varieties

S. No	Varieties	Selection criteria's						
		Grain Yield	Panicle length	Plant Height	Lodging index	Diseases	Total score	Rank
1	Dursi	1	1	1	1	1	5	1st
2	Ebba	3	3	3	1	3	13	3rd
3	Areka-1	4	4	4	2	4	18	4th
4	Quncho	2	2	2	2	2	10	2nd

1= Excellent, 2= Very good, 3= Good, 4= Poor


Fig 1: Photo taken during field day events at Selga 23 kebele in Ura district

CONCLUSION AND RECOMMENDATION

The tef demonstration was conducted at Ura district of Assosa Zone. The three recently released improved tef varieties were demonstrated with standard check called Quncho variety. Farmers were selected Dursi variety based on selection criteria like grain yield, diseases resistance, plant height, panicle length, lodging index and seed color. Dursi variety was recorded highest grain yield, plant height, and biomass as compared to other varieties. So, we are tentatively recommended Dursi variety for Assosa areas.

Competing Interests: The authors declared that they have no conflict of interests.

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